

provides a second time interval wherein the second time interval is shorter than the first time interval and commences at the end of the first time interval; and

emits an output signal from the detector if a further detection signal is present within the detector during the second time interval.

10. (Amended) Optical apparatus according to claim 9, wherein the object is a cutting tool.

Please add new claim 11 as follows:

--11. A method of making measurements of an object on a machine using an optical measuring apparatus which includes a light source which generates a beam of light which is incident upon a detector and a detector, the method comprising upon a detector and a detector, the method comprising the steps, in any suitable order, of:

rotating the object;

causing light to be emitted from the light source;

generating a first detection signal within the apparatus when the beam of light from the light source, incident on the detector, is interrupted;

generating a first time interval when the first detection signal is generated;

evaluating whether there is a further occurrence of the detection signal during a second time interval, which commences at the end of the first time interval and is shorter than the first time interval; and

emitting an output signal from the apparatus only if a further detection signal is present within the apparatus during the second time interval.--

REMARKS

Claims 1-11 are pending in this application. By this Amendment, the specification is amended to correct minor informalities, claims 1-4, 9 and 10 are amended to distinguish over the applied references, and new claim 11 is added. No new matter is added by this

Amendment. Reconsideration in view of the foregoing amendments and followings remarks is respectfully requested.

The attached Appendix includes marked-up copies of each rewritten paragraph (37 C.F.R. §1.121(b)(1)(iii)) and claim (37 C.F.R. §1.121(c)(1)(ii)).

I. Formal Matters

The Office Action objects to the drawing figures for failing to show every feature of the invention specified in the claims. Applicants respectfully submit that the claims have been amended to remove the features cited by the Office Action. Therefore, Applicants respectfully request that the objection to the drawings be withdrawn.

The Office Action objects to the specification for lacking an Abstract, improper incorporation by reference of a foreign application, and for failure to define t in the expression $t_1 + \frac{1}{2}t$, and the arrangement of the specification.

Regarding the Abstract, Applicants submit that this Amendment includes an Abstract on a separate sheet as required by 37 C.F.R. §1.72(b). Regarding the incorporation of essential material in the specification, Applicants respectfully submit that the disclosure as filed is complete, the material incorporated by reference refers to nonessential material, and further that the incorporation by reference has been canceled by this Amendment. Regarding the definition of " t " in the expression " $t_1 + \frac{1}{2}t$," the specification has been amended to recite that t is the variation in t_1 , or 3ms. Support for this can be found in the lines preceding this expression. Regarding the arrangement of the specification, Applicants respectfully submit that by this Amendment, the specification has been amended to conform to the suggested arrangement in 37 C.F.R. §1.77(b). Therefore, Applicants respectfully request that all outstanding objections to the specification be withdrawn.

The Office Action objects to claims 2 and 10 due to minor informalities. By this Amendment, claims 2 and 10 have been amended to correct the stated informalities.

Therefore, Applicants respectfully request that the objection to claims 2 and 10 be withdrawn.

The Office Action rejects claims 9 and 10 under 35 U.S.C. §112. Applicants respectfully submit that claims 9 and 10 have been amended responsive to the rejection. Therefore, Applicants respectfully request that the rejection of claims 9 and 10 under 35 U.S.C. §112, be withdrawn.

II. Claims 1-11 Define Patentable Subject Matter

Applicants appreciate the Office Action's indication that claims 4-8 would be allowable if rewritten in independent form to include all the limitations of the base claim and any intervening claims. However, for the reasons set forth below, Applicants respectfully submit that all of claims 1-11 define patentable subject matter.

The Office Action rejects claims 1-3, 9 and 10 under 35 U.S.C. §102(b) as anticipated by DE 3,905,949 to Schultz et al. (hereinafter Schultz). Applicants respectfully traverse the rejection.

In particular, Applicants respectfully submit that Schultz fails to suggest or disclose a method of making measurements on an object using an optical measuring apparatus which includes a light source which generates a beam of light, and a detector upon which is incident the beam of light, the method comprising at least the steps of causing a beam of light to be emitted from the light source, generating a first detection signal within the detector when the beam of light from the light source is interrupted, providing a first time interval when the first detection signal is generated, providing a second time interval wherein the second time interval is shorter than the first time interval and commences at the end of the first time interval, and emitting an output signal from the detector if a further detection signal is present within the detector during the second time interval, as recited in amended claim 1, and similarly recited in amended claim 9 and new claim 11.

In contrast to the claimed invention, Schultz instead describes a non-contact tool evaluation method whereby the difference in effective diameter between the tallest and shortest teeth on a cutter can be determined. For example, the method of Schultz is used for the purpose of determining the appropriate time to replace the cutting blades on a machine tool. The number of pulses 18 produced by the cutter teeth when interrupting an optical sensing device 7 is counted. A signal 21 is matched to the rotary frequency of the tool and is used to reset the counting. Pulses per revolution of the tool are counted until all teeth on a revolution have been counted. The spacing of the pulses can be indicative of the condition of the teeth on the cutting blade.

Thus, while Schultz disclose a time interval for counting pulses which correspond to the teeth on a cutting blade, he fails to suggest or disclose providing a second time interval shorter than the first time interval which commences at the end of the first time interval, as recited in claims 1, 9 and 11. Moreover, Schultz fails to suggest or disclose emitting an output signal if a detection signal is present during the second time interval. Therefore, in view of these distinctions, Applicants respectfully submit that independent claims 1, 9 and 11 are patentable over Schultz. Dependent claims 2, 3 and 10 are likewise patentable over Schultz for at least the same reasons as independent claims 1 and 9. Accordingly, Applicants respectfully request that the rejection of claims 1-3, 9 and 10 under 35 U.S.C. §102(b), be withdrawn.

III. Conclusion

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable consideration and prompt allowance are earnestly solicited. Should the Examiner believe that anything further is desirable in order to place this application in better condition for allowance, the Examiner is requested to contact the Applicants' representative at the telephone number listed below.

Respectfully submitted,



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Attachments:

Appendix
Abstract
Petition for Extension of Time
Information Disclosure Statement

Date: April 18, 2003

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<p>DEPOSIT ACCOUNT USE AUTHORIZATION Please grant any extension necessary for entry; Charge any fee due to our Deposit Account No. 15-0461</p>



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Changes to Specification:

Page 5, lines 14-18:

Further mechanical and optical details of an example of such an apparatus are described in ~~our~~ European Patent Application No. 00303749.6 ~~(which is hereby incorporated into this specification by reference) and are not therefore reproduced here.~~

Page 7, lines 3-5:

To centre the trigger signal in the time interval t_2 , t_2 is set at $t_1 + \frac{1}{2}t$ which must be equal to 60ms, where t is the variation in t_1 or 3ms. Thus t_1 was actually set at 58.5ms.

Changes to Claims:

Claim 11 is added.

The following is a marked-up version of the amended claims:

1. (Amended) A method of making measurements of an object ~~on a machine~~ using an optical measuring apparatus which includes a light source which generates a beam of light, and a detector, upon which is incident upon a detector the beam of light, the method comprising the steps, in any suitable order, of:

causing a beam of light to be emitted from the light source;
generating a first detection signal within the detector each time when the beam of light from the light source is interrupted;
~~evaluating the frequency and/or duration of the occurrences of said detection signals;~~
providing a first time interval when the first detection signal is generated;
providing a second time interval wherein the second time interval is shorter than the first time interval and commences at the end of the first time interval;

emitting an output signal from the detector ~~only if~~ a further detection signal is present within the detector ~~in a specified time interval from the generation of an earlier detection signal~~ during the second time interval.

2. (Amended) A method according to of making measurements of an object as claimed in claim 1 and comprising the further comprising the steps of:

rotating the object; and

wherein the first time interval is dependent on the speed of rotation of the object.

~~generating a first time interval (t_1) which is dependent on the speed of rotation of the object; and~~

~~generating the specified time interval as a time interval (t_2) which is shorter than (t_1) and commences at the end of the interval (t_1).~~

3. (Amended) A method according to of making measurements of an object as claimed in claim 2 wherein the object is a tool on a machine tool and the tool is rotated at a known specific speed- having a tool edge, and the first time interval (t_1) is substantially equal to the time taken for one revolution for the edge of the tool to come around again following its interruption with the beam.

4. (Amended) A method according to claim 3 wherein the apparatus further includes a clock, the method comprising the further steps of:

rotating the tool;

causing the clock to initiate the emission of a series of pulses ~~of short duration~~ each of which are equal in duration to the second time interval and are synchronised with the speed of rotation of the tool, the first pulse being emitted to coincide with a detection signal being generated in the detector;

emitting an output signal from the detector only if a detection signal is also present within the detector during the existence of a clock pulse;

stopping the clock if no such detection signal is present in the detector.

9. (Amended) Optical apparatus for measuring objects ~~on machines~~ comprising a light source for generating a beam of light ~~beam~~ and comprising a detector for ~~receiving~~ arranged to receive the said beam and ~~which generates~~ for generating a signal when the beam is interrupted, wherein the detector ~~includes in use:~~

generates a first detection circuit which generates a signal within the detector when the beam of light from the light source, incident on the detector each time the beam is interrupted; and ~~signal processing means for evaluating the frequency and/or duration of the occurrences of said signals-~~

provides a first time interval when the first detection signal is generated;

provides a second time interval wherein the second time interval is shorter than the first time interval and commences at the end of the first time interval; and which

emits an output signal only if a second signal is generated by the detection circuit from the detector if a further detection signal is present within a specified the detector during the second time interval after the occurrence of said signal.

10. (Amended) Optical measuring apparatus according to claim 9, and wherein the object is a cutting tool ~~on a machine tool~~.